

## Meccano

The present invention relates to the field of playthings, construction sets, etc., assembled using connective non-adhesive elements.

A meccano is known which comprises connective elements and formative parts looking like a polygon with coupling elements configured as rectilinear sides (US No.4,343,117 Cl. A 63 H 33/10, 1982).

A disadvantage of this meccano is a comparatively small number of possible connections and combinations of mutual locations of formative elements.

A more perfect and closest prior art to the claimed invention is a known meccano containing connective elements and various polygonal formative parts with coupling elements in the form of rectilinear sides with a length in the nominal of modular and/or modular-derivative size (US No.5,183,430 Cl. A 63 H 33/08, 1993).

However, due to the fact that connective elements of this meccano are articulated, connecting formative parts is performed by implementing simplest operations conditioned only by dimensions of coupling elements, which in the long run lowers the intellectual level of the game.

The object to the solution of which is directed the claimed invention is providing a game with high intellectual level of problems to be solved.

The technical result that can be achieved in implementing the invention lies in creation of a game environment requiring foreseeing of a non-obvious result of subsequent several couplings and conscious selection for this purpose of an aggregate of appropriate formative parts and connective elements.

The above technical result is achieved by a meccano comprising connective elements and various polygonal formative parts with coupling elements configured as rectilinear sides with a length in the nominal of modular and/or modular-derivative size

due to the fact that the connective elements are in the form of a group of links having different fixed angles of mutual disposition of the formative parts to be connected.

As well as due to the fact that polygonal formative parts are configured as a group of formative parts looking like either equilateral triangles with a side length in the nominal equal to modular size, and/or isosceles triangles with two sides in the nominal equal to the value of modular size and having one side equal to the value of product of the modular size and square root of two; and/or isosceles triangles with two sides in the nominal equal to the value of the product of modular size and square root of two and having one side in the nominal equal to the value of modular size; and/or squares with a side length in the nominal equal either to modular size or to the amount multiple of modular size; and/or regular hexagons with a side length in the nominal equal to modular size; and/or rectangles with the major side length in the nominal equal to the amount multiple of modular size and with the minor side length in the nominal equal to modular size; and/or non-equilateral rectangular triangles with a length in the nominal of hypotenuse equal to two modular sizes when the length of one cathetus is equal in the nominal to modular size; and/or isosceles trapezoids with a length in the base nominal equal to modular size and to two modular sizes and with a length in the lateral side nominal equal either to the amount of the product of modular size and square root of two, or to the value of modular size, whereby the connective elements in the form of a group of links are provided with elements of fixing at least two formative parts to ensure one angle of their mutual disposition equal to  $90\pm10^\circ$  or  $101\pm10^\circ$  or  $112\pm10^\circ$  or  $120\pm10^\circ$  or  $131\pm10^\circ$  or  $136\pm10^\circ$  or  $139\pm10^\circ$  or  $150\pm10^\circ$  or  $180\pm10^\circ$ .

As well as due to the fact that the elements of fixing are configured as elastically strained paired arcuate parts having a gap therebetween and a common base of differently directed relative to the gap direction paired arcuate parts, whereby the

coupling elements of the formative parts are provided with edge recesses to receive the common base of paired arcuate parts and with a projecting portion of the edge surface of the base of the edge recess for coupling to the elements of fixing.

The term "modular size" means a size of constant value independent of the configuration of the formative part.

The term "modular-derivative size" means a size multiple of modular size or mathematically determined by functional dependence on modular size conditioned by the geometry of formative part configuration.

The term "nominal" means a geometrically determined value independent of precision of producing the formative part and the connective element.

The essence of the claimed invention is clarified with drawings, where Fig.1 shows plan views of the formative parts, Fig.2 shows cross-section A-A of Fig.1, Fig.3 shows sectional view of a variant of connection of the formative parts, Fig.4 shows plan views of a group of links, and Fig.5 shows a view of a variant of three-dimensional model from formative parts of the meccano.

The meccano contains formative parts looking like, respectively, either equilateral triangles 1, and/or non-equilateral rectangular triangles 2, and/or isosceles triangles 3 and 4, and/or squares 5 and 6, rectangles 7, and/or regular hexagons 8, and/or isosceles trapezoids 9 and 10. Each formative part has coupling elements configured as rectilinear sides, respectively, with a length in the nominal of modular "M" and/or modular-derivative size. In particular, the equilateral triangles 1 have sides 11 with a length in the nominal of modular "M" size; the non-equilateral rectangular triangles 2 have hypotenuse 12 with a length in the nominal equal to the amount multiple of modular size, for example, to two modular sizes "M\*2", when one the length of one cathetus 13 is in the nominal equal to modular size "M"; isosceles triangles 3 have two sides 14 with a length in the nominal of modular "M" size and one side 15 with a length in the nominal of

modular-derivative size and equal to the amount of product of modular size and square root of two " $M*\sqrt{2}$ "; isosceles triangles 4 have two sides 16 with a length in the nominal of modular-derivative size and equal to " $M*\sqrt{2}$ ", and one side 17 with a length in the nominal of modular "M" size; squares 5 have sides 18 with a length in the nominal of modular "M" size; squares 6 have sides 19 with a length in the nominal of modular-derivative size and equal to a value of multiple of modular size, in particular " $M*2$ "; rectangles 7 have two sides 20 with a length in the nominal of modular-derivative size and equal to the a value of multiple of modular size, in particular, " $M*2$ ", and two sides 21 with a length in the nominal of modular "M" size; regular hexagons 8 have sides 22 with a length in the nominal of modular "M" size; isosceles trapezoids 9 have major base 23 with a length in the nominal of modular-derivative side and equal to a value of multiple of modular size " $M*2$ ", a length of minor base 24 equal in the nominal to modular size "M" and a length of lateral sides 25 with a length in the nominal of modular-derivative size and equal to " $M*\sqrt{2}$ "; isosceles trapezoids 10 have a length of major base 26 in the nominal of modular-derivative size and equal to a value of multiple of modular size " $M*2$ ", a length of minor base 27 equal in the nominal to modular size "M" and a length of lateral sides 28 equal in the nominal to modular size "M".

The meccano contains a group of links each of which is provided with elements of fixing in the form of elastically strained paired arcuate parts 29 having a gap 30 therebetween and common base 31 of differently directed relative to the gap direction paired arcuate parts 29 and, for example, 32, whereby the coupling elements of the formative parts are provided with edge recesses 33 to receive common base 31 and with projecting part 34 of edge surface 35 of the base of edge recess 33 for coupling to elements of fixing.

The links as connective elements are formed with various fixed angles of mutual disposition of the formative parts to be connected. In particular, the links of embodiments 36, 37, 38 and 39 are adapted to fix one mutual disposition of at least two formative parts ensuring the angle of their mutual disposition equal to the nominal value of  $90\pm10^\circ$ ; the links of embodiment 40 ensure the angle equal to the value of  $101\pm10^\circ$ ; the links of embodiment 41 ensure the angle equal to the value of  $112\pm10^\circ$ ; the links of embodiments 38 and 42 ensure the angle equal to the value of  $120\pm10^\circ$ ; the links of embodiment 39 ensure the angle equal to the value of  $131\pm10^\circ$ ; the links of embodiment 41 ensure the angle equal to the value of  $136\pm10^\circ$ ; the links of embodiment 39 ensure the angle equal to the value of  $139\pm10^\circ$ ; the links of embodiment 43 ensure the angle equal to the value of  $150\pm10^\circ$ ; while the links of embodiment 37 ensure the angle equal to the value of  $180\pm10^\circ$ .

Achievement of the technical result as to providing coupling and connection of the parts and links is ensured by making sides with modular and modular-derivative sizes with deviation from being equal to the nominal within 2% toward the lesser value.

Implementing the meccano capabilities is effected as follows.

In order to connect the formative parts to each edge recess of the coupling element, one link of those present in the group is inserted.

Connection of the formative parts is performed by consecutive matching of sides and placing in adjacent edge recesses 33 links while pinching projecting parts 34 by elastically strained paired arcuate parts, for example, 29 and 32. In selecting a link, it is necessary to take account of the desirable angle of mutual disposition of the formative parts to be assembled and the configuration of the formative part allowable for such an angle. For example, when setting trapezoids 9 along the perimeter of hexagon 8 to link sides 22 and bases 24, the link of embodiment 39 will be required ensuring the angle

equal to the value of  $131^\circ$ , while to link sides 25, the link of embodiment 41 will be required ensuring the angle equal to the value of  $136^\circ$ . Thus, modular and modular-derivative side sizes, the aggregate of formative part configurations and the group of links having various fixed angles of mutual disposition of the formative parts to be connected enable one to provide flat and three-dimensional different models by means of solving spatial problems in function of angle, size and shape parameters.